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Agriculture

Forest Service

Forest
Products
Laboratory

DIVIDENDS FROM WOOD RESEARCH

Recent Publications

July - December 1983

Instructions and Explanation

"Dividends From Wood Research" is a semiannual listing of recent publications resulting from wood utilization research at the Forest Products Laboratory (FPL). These publications are produced to encourage and facilitate application of Forest Service research. This issue lists publications received from the printer by the FPL Publications Section between July 1, 1983, and December 31, 1983.

On October 1, 1982, the Department of Agriculture began a departmentwide cost reduction and sales recovery program for publications. This program aims to reduce the Federal Government's printing and distribution costs by (1) limiting the number of free copies available from the Government and (2) referring inquiries to established sales outlets.

Each publication listed in this brochure is available through at least one of the sources below. For each entry in the brochure, we indicate the primary source for that publication and show you how to obtain a copy:

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List of Categories

Publications are listed in this brochure within the following general categories:

- Adhesives
- Anatomy and properties
- Buildings and construction
- Chemistry
- Degradation and protection
- Design data
- Fire (no listings for this issue)
- General
- Mycology
- Packaging
- Processing (drying, machining, sawing, gluing, grading)
- Pulp and paper
- Residues and energy
- Wood materials

adhesives

1. Microscopy of Acid-Activated Bonding in Wood

Murmanis, L.
Wood Fiber Sci. 15(3): 203-211; 1983.

Fluorescence and scanning electron microscopy were used to reveal the effect of nitric acid on activated bonding of wood. The physical properties of the treated wood were analyzed and the feasibility of the bonding technique was evaluated. Results show that the bonding technique is too severe, as it greatly damages the wood. Lignin and lignin-containing gap fillers applied during acid treatment do not seem to change the action of the acid on the wood.

2. Formaldehyde Emission from Particleboard and Plywood Paneling: Measurement, Mechanism, and Product Standards

Myers, George E.
Forest Prod. J. 33(5): 27-37; 1983.

The author tested a number of commercial panel products, primarily particleboard and hardwood plywood, for their formaldehyde emission behavior using desiccator, perforator, and dynamic chamber methods. He observed a tenfold range of formaldehyde emissions, well above and below acceptable levels for mobile homes. He concluded that, without large safety factors and/or much more testing, neither the desiccator nor perforator test could provide reliable product standards for board emission.

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anatomy and properties

3. Characterization of Physical and Mechanical Properties of 2 by 4 Truss Lumber

Gerhards, C. C.
USDA Forest Serv. Res. Pap. FPL 431, 1983.

This report, along with a previous report, provides strength data for engineering evaluation of wood truss reliability. It summarizes data on dimensional characteristics, optimum grade, and regressions of strength on modulus of elasticity and grade of lumber specimens sampled from truss fabricators in Illinois.

4. Data for a Computer-Assisted Wood Identification System

I. Commercial Legumes of Tropical Asia and Australia

Quirk, J. T.
IAWA Bull. n.s. 4(2-3) 118-130; 1983.

A wood anatomical key based on macroscopic and microscopic features was developed for identification of the commercial Leguminosae of southeast Asia and Australia. All anatomical details are in accord with the standard list of characters suitable for computerized hardwood identification. These data are in the computer data base at the Forest Products Laboratory. All genera are separable, on the basis of anatomical features, but some species are not.

5. Strength and Stiffness of Clear Douglas-fir Exposed to the Mount St. Helens Volcanic Eruption

Resch, H.; Johnson, J. W.; Bendsten, B. A.
Forest Prod. J. 33(7/8): 52-56; 1983.

This study determined thermal and blast effects of the Mount St. Helens volcanic eruption on the bending strength and stiffness of clear Douglas-fir.

buildings and construction

6. Light-Frame Wall Systems: Performance and Predictability

Gromala, David S.
USDA Forest Serv. Res. Pap. FPL 442, 1983.

This paper compares results of wall tests with analytical predictions of performance. Conventional wood-stud walls of one configuration failed at bending loads 4 to 6 times design load. The computer model over-predicted wall strength by an average of 10 percent and deflection by an average of 6 percent.

7. Performance of Low-Rise Timber Buildings Subjected to Seismic, Wind, and Snow Loads

Soltis, Lawrence A.
In: ASCE annual meeting; 1983 May 16-19; Philadelphia. Preprint 83-015. New York: American Society of Civil Engineers; 1983.

The author discusses the observed performance of timber structures subjected to natural disasters and suggests how this performance might be improved.

8. The Kieper and MOISTWALL Moisture Analysis Methods for Walls

TenWolde, A.
In: Thermal performance of the exterior envelopes of buildings II: Proceedings, ASHRAE/DOE conference; 1982 December 6-9; Las Vegas, NV. Atlanta, GA: American Society of Heating Refrigerating and Air-Conditioning Engineers, Inc.; 1983: 1033-1051.

This paper describes the Kieper method in detail and discusses its advantages and limitations. The major advantage is the relative ease of determining the most likely location for condensation in a wall and comparing the performance of different wall designs under identical environmental conditions. The Kieper method is graphical and, like the moisture profile method, based on one-dimensional steady-state vapor

diffusion theory. The MOISTWALL program is the author's adaptation of the Kieper method for use on a programmable calculator.

9. Contribution of Gypsum Wallboard to Racking Resistance of Light-Frame Walls

Wolfe, Ronald W.
USDA Forest Serv. Res. Pap. FPL 439, 1983.

Gypsum wallboard is the most commonly used interior wall sheathing material. Evidence suggests that it contributes to the shear performance of light-frame walls. Thirty light-frame walls were evaluated to characterize the gypsum wallboard contribution to shear wall racking performance. Results of this study provide a basis for engineers and code authorities to judge the contribution of gypsum wallboard to the shear resistance of walls under windloads and seismic loads. Results will also be useful in planning future research for light-frame construction.

chemistry

10. Effects of Nitrate on Fermentation of Xylose and Glucose by *Pachysolen tannophilus*

Jeffries, Thomas W.
Bio/Technology 1(6): 503-506; 1983.

Xylose is a major constituent of hardwood and agricultural residues. Its effective utilization is essential to the economic practicability of any process seeking to use these materials for chemical production. A yeast, *Pachysolen tannophilus*, was shown to ferment xylose to ethanol, acetic acid and xylitol, but the rate was slow and yields of ethanol were low. Growth rates and product ratios were affected significantly by the nitrogen source used. These results suggest that selection for NO₃⁻ utilization can be a useful screen in the development of yeast strains with improved ability to ferment xylose.

11. Utilization of Xylose by Bacteria, Yeasts, and Fungi

Jeffries, Thomas W.
In: Fiechter, A., ed. Advances in biochemical engineering/biotechnology, 27. Berlin, Heidelberg, New York: Springer-Verlag; 1983; 32 p.

This review examines recent microbiological findings in relation to the previous understanding of D-glucose fermentation and pentose metabolism. It briefly examines the availability of hemicellulosic sugars--particularly D-xylose--in lignocellulosic residues, reviews aspects of pentose metabolism and metabolic regulation of fermentative processes, and discusses some recent research progress on aerobic and anaerobic conversions of D-xylose to ethanol by yeasts and bacteria.

12. Occurrence and Inhibition of Chitin in Cell Walls of Wood-Decay Fungi

Johnson, Bruce R.; Chen, George C.
Holzforschung 37(5): 255-259; 1983.

A primary objective of this study was to verify and quantify the presence of chitin in the cell wall of those fungi that commonly cause decay of wood and wood products. Thirteen common wood-decay fungi were cultured in nutrient broth for 2 weeks, with and without low concentrations of chitin-inhibiting polyoxin mixture. Responses of three species to varying polyoxin concentrations suggest the inhibition of chitin-linked R-glucan synthesis.

13. Nonfermentable, Glucose-Containing Products Formed From Glucose Under Cellulose Acid Hydrolysis Conditions

Minor, J. L.
J. Appl. Polym. Sci.: Appl. Polym. Symp. 37: 617-629; 1983.

Solutions of D-glucose in dilute sulfuric acid were allowed to react under time and temperature conditions which simulated the production of glucose from cellulose. Under these conditions, glucose undergoes a number of reactions including isomerization, dehydration, transglycosidation, polymerization, and anhydride formation. The specific interest in this report was to investigate the reversible reactions which form "reversion products."

14. Adducts of Anthrahydroquinone and Anthranol with Lignin Model Quinone Methides. 3. Independent Synthesis of Threo and Erythro Isomers

Ralph, John; Landucci, Lawrence L.
J. Org. Chem. 48(22): 3884-3889; 1983.

A key intermediate responsible for anthrahydroquinone- (AHQ-) catalyzed delignification of wood under alkaline conditions is an adduct between AHQ and a quinone methide (QM) of a phenylpropanoid lignin subunit represented by models such as 1-(3-methoxy-4-hydroxyphenyl)-2-(2-methoxyphenoxy) propane-1,3-diol. Unlike adduct formation via QMs, which give only threo products with AHQ or anthranol (9-hydroxyanthracene), both isomers were successfully prepared by alkylating 9,10-bis(trimethylsiloxy)anthracene or 9-(trimethylsiloxy)anthracene with α -bromo derivatives of lignin models in the presence of the Lewis acid zinc bromide.

15. Synthesis of Polyhalogenated Phenyl Isocyanates

Rowell, Roger M.; Chen, George C.
Polym. Mater. Sci. and Eng. Proc. 49: 151-158; 1983.

The effects were investigated of basicity and mole ratio of triethylamine, pyridine, and tetramethylurea on isocyanate and urea byproduct formation from phosgenation of 2,3,5,6-tetrachloroaniline. 2,3,5,6-tetrachloroaniline was added to 8 moles excess phosgene dissolved in 1,2-dichloroethane. The results indicate the stronger base such as triethylamine promotes the isocyanate formation, while the weaker base, tetramethylurea, promotes the urea byproduct formation.

16. Dilute Sulfuric Acid Prehydrolysis of Southern Red Oak Chips by Direct Steam Heating

Scott, Ralph W.; Wegner, Theodore H.; Harris, John F.
J. Wood Chem. Technol. 3(3): 245-260; 1983.

The authors' use of the term, prehydrolysis, is limited to a dilute acid hydrolysis which separates water soluble hemicellulose fragments from insoluble lignocellulose. In this study, they determined the product yields from the acid prehydrolysis of southern red oak under practical operating conditions. Specifically, product yields from wood chips after short acid impregnation times were determined in a batch digester operation. The effects of long acid impregnations and of the neutralizing capacity of wood are also included.

17. Quantitative Separation of Ether-Soluble Acidic and Neutral Materials

Zinkel, Duane F.
J. Wood Chem. Technol. 3(2): 131-143; 1983.

The author gives details of the method for separating neutral from acidic components of lipophilic materials (e.g., ether extractives, rosins, tall oil) using DEAE-Sephadex. The method can be accomplished rapidly and quantitatively without chemical alteration of the components.

degradation and protection

18. Mechanical Properties of Longleaf Pine Treated with Waterborne Salt Preservatives

Bendtsen, B. A.; Gjovik, L. R.; Verrill, S. P.
USDA Forest Serv. Res. Pap. FPL 434, 1983.

In small clear specimens of longleaf pine sapwood, neither ammonium chromated arsenate (ACA) nor chromated copper arsenate (CCA) preservatives adversely affect the modulus of elasticity of wood either air or kiln dried after treatment to retentions from 0.25 to 2.5 lb/ft³. ACA has no effect on MOR, but CCA-type preservatives vary in their adverse effects which may be aggravated by kiln drying. Work to maximum load is adversely affected by all preservatives tested but least by ACA. This study shows that kiln drying at 140° F can adversely affect the mechanical properties of wood treated with certain waterborne preservatives.

19. Improved Colorimetric Determination of Cell Wall Chitin in Wood Decay Fungi

Chen, George C.; Johnson, Bruce R.
Appl. Environ. Microbiol. 46(1): 13-16; 1983.

The Svennerholm modification of the Elson-Morgan method for glucosamine analysis was evaluated for its applicability to the rapid determination of chitin in wood decay fungi. The evaluation included extent of chromogen interference, sensitivity, color stability, and hydrolysis conditions for maximum release of glucosamine from fungal cell walls. With the authors' further modification, the Svennerholm method was shown to be suitable for rapid quantitative determination of fungal chitin without chromatographic separation of hydrolysate chromogens.

20. Natural Decay Resistance of the Heartwood of Coast Redwood *Sequoia sempervirens* (D. Don) Endl.

Clark, Joe W.; Scheffer, Theodore C.
Forest Prod. J. 33(5): 15-20; 1983.

Decay resistance of outer heartwood of butt logs, from 83 old-growth and 84 young-growth trees of *Sequoia sempervirens* (D. Don) Endl., was laboratory tested by the soil-block method with the wood rotters *Poria placenta* (Fr.) Cke. and *Gloeophyllum trabeum* (Pers.) Murr. Overall, very resistant wood was about five times more prevalent in old-growth than in young-growth trees. The most resistant wood was in the outer heartwood of the butt log; above this there was no practically significant variation in resistance in relation to height.

Alternatives to Termiticides in Building Protection

DeGroot, Rodney C.
In: Khasawinah, A. M., ed. Termiticides in Building Protection; 1982 September 22-23; Washington, DC. Chicago, IL: Velsicol Chemical Corp.; 1983: 91-94. (Copies of this document are available from the National Institute of Building Sciences (Mr. Neil Sandler), 1015 15th Street, NW, Suite 700, Washington, DC 20005.) (Price for entire workshop proceedings: \$12 for National Institute of Building Sciences' Consultative Council members, \$15 for nonmembers.)

Termite Control Research at the Forest Products Laboratory

DeGroot, Rodney C.
In: Khasawinah, A. M., ed. Termiticides in Building Protection; 1982 September 22-23; Washington, DC. Chicago, IL: Velsicol Chemical Corp.; 1983: 107-109. (Copies of this document are available from the National Institute of Building Sciences (Mr. Neil Sandler), 1015 15th Street, NW, Suite 700, Washington, DC 20005.) (Price for entire workshop proceedings: \$12 for National Institute of Building Sciences' Consultative Council members, \$15 for nonmembers.)

21. Decay in Mine Timbers. Part I. Sampling Procedures and Conditions and Descriptions of Samples

Eslyn, Wallace E.
Forest Prod. J. 33(6): 27-30; 1983.

To aid in the prevention of mine accidents, timber framing must be regularly inspected for decay. It is necessary to first develop a means of assessing the condition of timbers and determining their strengths.

This paper is part I of a three-part series covering decay in mine timbers, and describes sampling procedures and conditions and descriptions of samples.

22. Decay in Mine Timbers. Part II. Basidiomycetes Associated with Decay of Coal Mine Timbers

Eslyn, Wallace E.; Lombard, Frances F.
Forest Prod. J. 33(7/8): 19-23; 1983.

In an effort to identify fungi responsible for decay of coal mine timbers, 177 basidiomycetous isolates--158 of which were identified--were obtained from decaying timbers in 18 mines from 6 major coal mining states. The brown-rot fungus *Coniophora puteana* overwhelmingly dominated the isolations made from both hardwood and softwood hosts.

23. Laboratory Evaluation of Selected Fungicides for Control of Sapstain and Mold on Southern Pine Lumber

Eslyn, Wallace E.; Cassens, Daniel L.
Forest Prod. J. 33(4): 65-68; 1983.

The authors tested a number of fungicides for their efficacy in controlling stain and mold on green southern yellow pine lumber to find replacements for sodium pentachlorophenate with lower mammalian toxicity. The fungicides 3-iodo-2-propyl butyl carbamate, copper-8-quinolinolate, and 2-(thiocyanomethyl) benzothiazole plus methylene-bis-thiocyanate proved as effective as sodium pentachlorophenate. The test method used is similar to that under consideration by a committee of the American Society for Testing and Materials.

24. Relationship Between Lignin Degradation and Production of Reduced Oxygen Species by *Phanerochaete chrysosporium*

Faison, Brendlyn D.; Kirk, T. Kent
Appl. Environ. Microbiol. 46(5): 1140-1145; 1983.

The relationship between the production of reduced oxygen species, hydrogen peroxide (H_2O_2), superoxide (O_2^-), and hydroxyl radical (OH), and the oxidation of synthetic lignin to CO_2 was studied in whole cultures of the white-rot fungus *Phanerochaete chrysosporium* Burds.

25. Outdoor Wood Finishes. Varnish is Pretty, but Paint's Tougher

Feist, William C.
Fine Wood Working. September/October 1983: 66-67.

The author discusses the use of paint and varnishes, water-repellent preservatives, and pigmented or semitransparent stains to protect wood which must be left outdoors. Also discussed are the processes used prior to painting or staining.

26. Influence of O_2 and CO_2 on Wood Decay by Heartrot and Saprot Fungi

Highley, T. L.; Bar-Lev, S. S.; Kirk, T. K.; Larsen, M. J.
Phytopathol. 73(4): 630-633; 1983.

The effect of various partial pressures of O_2 and CO_2 on decay in sapwood and heartwood by four heartrot fungi and three saprot fungi was studied to determine whether heartrot fungi possess ligninolytic and cellulolytic systems tolerant of low O_2 and high CO_2 levels. Results indicate that the unique ecology of the heartrot fungi is not attributable to an unusual ability to decompose wood at the high CO_2 and low O_2 concentrations found in the hearts of living trees.

27. Decomposition of Cellulose by *Poria placenta*: Light and Electron Microscopy Study

Highley, Terry L.; Palmer, John G.; Murmanis, Lidija L.
Holzforschung 37(4): 179-184; 1983.

The degradation of isolated cellulose by the brown-rot fungus *Poria placenta* was studied by light and electron microscopy. Observations of TEM micrographs seem to support earlier suggestions that the initial dissolution of cellulose is accomplished by a small diffusible depolymerizing agent. Furthermore, the results suggest that the depolymerizing agent may be produced intracellularly. In addition, the extracellular material or sheath that associates with mycelial hyphae may aid in concentrating and transmitting this agent to the fibers.

28. Field Trials with Ammoniacal Copper Borate Wood Preservative

Johnson, Bruce R.
Forest Prod. J. 33(9): 59-63; 1983.

This paper reports on field trials using ammoniacal copper borate (ACB) for wood preservation. The tests were conducted under varied conditions and in different environments. At the highest retention, panels were unattacked. ACB is not as suitable for wood protection as ammoniacal copper arsenate where the degradation hazard is high.

29. What Have Studies of Model Compounds Revealed about the Fungal Degradation of Lignin?

Kirk, T. Kent
In: International symposium on wood and pulping chemistry; 1983 May 23-27; Tsukuba, Japan. Tokyo, Japan: Japan Technical Association of the Pulp and Paper Industry; 1983; 3: 7-12.

The author reviews the use of dimeric model compounds (two aromatic nuclei) in investigations of the degradation of lignin by white-rot fungi, and compares the results of such studies with those obtained using lignin itself. Findings are summarized for the four types of compounds that have been studied. Findings of research using each of the four types of model compounds agree closely with those from research using lignin; moreover, model compounds and lignin have each contributed unique information.

A Rapid Method for Collecting Large Numbers of Subterranean Termites from Wood.

LaFage, J. P.; Su, N.-Y.; Jones, M. J.; Esenther, G. R.
Sociobiology 7(3): 305-309; 1983. (Available from Dr. J. P. LaFage, Louisiana State University, Department of Entomology, 402 Life Sciences Building, Baton Rouge, LA 70803. No charge. Supply limited.)

30. Degradation of Phenolic Compounds and Ring Cleavage of Catechol by *Phanerochaete chrysosporium*

Leatham, Gary F.; Crawford, R. L.; Kirk, T. Kent
Appl. Environ. Microbiol. 46(1): 191-197; 1983.

The purpose of this investigation was to characterize the ability of a mutant of *Phanerochaete chrysosporium* with ligninolytic activity and diminished phenoloxidizing enzyme activity to degrade phenolic compounds and to cleave aromatic rings. Ligninolytic activity in *P. chrysosporium* was induced by nitrogen starvation. Results indicate that the enzyme system responsible for degrading ring-cleavage products to CO_2 turns over faster than does the system responsible for ring cleavage.

31. Chapter 23: Bioactive Polymer-Wood Composites

Rowell, Roger M.
In: Roseman, T. J.; Mansdorf, S. Z., eds. Controlled release delivery systems. New York and Basel: Marcel Dekker, Inc.; 1983: 347-357.

Filling the voids in wood with bulk polymers containing bioactive compounds grafted onto or copolymerized with carrier polymers would inhibit attack in the same way as would bioactive materials grafted onto wood. The Forest Products Laboratory has actively researched both wood cell wall grafting and wood lumen polymer-filling technologies for several years. This chapter concerns part of the research done in the area of lumen polymer-filling technology.

Effects of a Dye, Sudan Red 7B, on the Formosan Subterranean Termite, *Coptotermes formosanus* Shiraki.

Su, N.-Y.; LaFage, J. P.; Esenther, G. R.
Material and Organismen 18(2): 127-133; 1983. (Available from Dr. J. P. LaFage, Louisiana State University, Department of Entomology, 402 Life Sciences Building, Baton Rouge, LA 70803. No charge. Supply limited.)

32. Lignin-Degrading Enzyme from the Hymenomycete *Phanerochaete chrysosporium* Burds.

Tien, Ming; Kirk, T. Kent
Science 221: 661-663; 1983.

The extracellular fluid of ligninolytic cultures of the wood-decomposing basidiomycete *Phanerochaete chrysosporium* Burds. contains an enzyme that degrades lignin substructure model compounds as well as spruce and birch lignins. It has a molecular size of 42,000 daltons and requires hydrogen peroxide for activity.

33. Effect of Grafted UV Stabilizers on Wood Surface Erosion and Clear Coating Performance

Williams, R. Sam
J. Appl. Polym. Sci. 28: 2093-2103; 1983.

The author developed and evaluated a new method for stabilizing the wood surface. HEBP [2-hydroxy-4-(2,3-epoxypropoxy)benzophenone] contains an ultraviolet (UV) stabilizer moiety that improved the xenon arc accelerated weathering performance of western redcedar (WRC). The weathering performance of the HEBP-modified WRC was compared with WRC treated with an unbound UV stabilizer of similar type and with untreated controls. The grafted stabilizer reduces the erosion rate of unfinished WRC; and, as a pretreatment under clear finishes (spar varnish and exterior grade polyurethane), the stabilized surfaces improve coating performance and color retention.

34. Effect of Delay between Treatment and Drying on Toughness of CCA-Treated Southern Pine

Winandy, J. E.; Bendtsen, B. A.; Boone, R. S.
Forest Prod. J. 33(6): 53-58; 1983.

Small clear specimens of southern pine were treated with chromated copper arsenate (CCA) type C preservative, maintained in a saturated condition for various periods of time (time delay), and dried using a technique intended to simulate kiln-drying conditions in full-size members. The objective was to determine the effects of various time-delay periods on the mechanism and magnitude of strength losses sometimes found in CCA-treated material. The authors conclude that the time delay between treatment with CCA and subsequent kiln-drying has little practical significance as far as strength losses are concerned.

design data

35. The Effect of Sample Size on Parameter Estimation for Doubly Censored Lumber Data

Dean, Margery A.
In: Early, James G.; Shives, T. Robert; Smith, John H., eds. Time-dependent failure mechanisms and assessment methodologies: Proceedings, 35th meeting of the mechanical failures prevention group; 1982 April 20-22; National Bureau of Standards, Gaithersburg, MD. London, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press; 1983: 91-99.

In life testing of lumber only a small percentage of the original sample under load may be available for distribution parameter estimation. To investigate the effect of sample size on parameter estimation, time-to-failure data were simulated from a two-parameter Weibull distribution. For three different sample sizes--50, 100, and 200--20 percent of the data were expected to fail on uploading and 30, 40, or 50 percent were expected to fail under constant load. The maximum likelihood parameter estimates were found and the resulting distribution of the parameters compared to the theoretical parameters.

36. Analysis of Censored Fatigue Data

Dean, Margery A.
In: Chen, W. F.; Lewis, A.D.M., eds. Recent advances in engineering mechanics and their impact on civil engineering practice: Proceedings, 4th engineering mechanics division specialty conference; 1983 May 23-25; Purdue University, West Lafayette, IN. New York: American Society of Civil Engineers; 1983; 2: 919-922.

The Weibull distribution is frequently used to describe the fatigue life distribution of lumber. The aim of this study was to determine the sample size and the number of failures required to estimate the underlying Weibull distribution with a required confidence. Results show that for the shape parameter of 0.25, a sample size of 100 is desirable and 60 percent of the sample should actually fail. Forty percent of the sample could remain unbroken, thereby considerably shortening the test time and freeing the test facility for other uses.

37. Predicting the Bending Strength of Ladder Rail Stock

Dean, Margery A.; Kass, Andrew J.
Forest Prod. J. 33(9): 9-16; 1983.

The strength of high-performance lumber products, such as ladders, scaffolding, and athletic equipment, is important to manufacturers and users. In the past, there was no way of knowing how strong a particular product might be without breaking it, therefore, nondestructive evaluation of the finished product was difficult. The objective of this study was to investigate the correlation of stiffness and density with bending strength of ladder rail stock and to investigate a non-destructive sorting scheme.

38. Estimating Correlation Between Strength Properties

Green, David W.; Evans, James W.
In: Chen, W. F.; Lewis, A.D.M., eds. Recent advances in engineering mechanics and their impact on civil engineering practice: Proceedings, 4th engineering mechanics division specialty conference; 1983 May 23-25; Purdue University, West Lafayette, IN. New York: American Society of Civil Engineers; 1983: 936-939.

The correlation between tensile and bending strength is an important consideration in the design of timber structures. Because of experimental difficulties in evaluating the tensile strength of wood parallel to the grain, the allowable tensile strength has historically been estimated as a function of the allowable bending strength. This paper suggests an approach to estimating the correlation between strength properties, and evaluates the precision with which the correlation may be determined.

39. Solar Heat Recovery from Windows in Light-Frame Wood Construction

Hans, G. E.; Calthorpe, P.
In: Thermal performance of the exterior envelopes of buildings II: Proceedings, ASHRAE/DOE conference; 1982 December 6-9; Las Vegas, NV. Atlanta, GA: American Society of Heating Refrigerating and Air-Conditioning Engineers, Inc.; 1983: 876-894.

Changes in thermal performance standards show growing emphasis on the need for heat-gain management in solar building designs having lightweight envelopes. This study investigated one option for such management in light-frame wood construction. Conclusions are drawn from observed field performance of two similar structures of comparable thermal mass; in one of them, solar heat recovered from a collector window was delivered to primary storage by forced airflow rather than by natural convection or radiation. Performance was judged on the basis of heat balance calculations for a 5-day midwinter period.

40. Stiffness and Strength of Uniformly Loaded Floors with In-Grade Lumber

Vanderbilt, M. D.; Criswell, M. E.; Bodig, J.; Moody, R. C.; Gromala, D. S.
USDA Forest Serv. Res. Pap. FPL 440, 1983.

This study develops procedures for obtaining realistic estimates of the stiffness and strength at first joist rupture of floors constructed from material with variable mechanical properties, and uses these procedures to develop definitive data on expected floor performance.

file

(No listings for this issue.)

general

Elasticities of Demand for United States Imports and Exports for Some Forestry Commodities--Summary of Findings

Buongiorno, Joseph; Chou, Jieh-Jen
Staff Paper Series No. 15, Department of Forestry, University of Wisconsin-Madison. (Available from Department of Forestry, School of Natural Resources, College of Agricultural and Life Sciences, University of Wisconsin, Madison, WI 53706. No charge.)

United States Demand for Hardwood Plywood Imports by Country of Origin

Chou, Jieh-Jen; Buongiorno, Joseph
Forest Sci. 29(2): 225-237; 1983. (Available from Dr. J. Buongiorno, Department of Forestry, School of Natural Resources, College of Agricultural and Life Sciences, University of Wisconsin, Madison, WI 53706. No charge.)

41. Wood Used in U.S. Manufacturing Industries, 1977

McKeever, David B.; Martens, David G.
USDA Forest Serv. Resour. Bull. FPL-12, 1983.

This report provides 1977 estimates of all uses of wood--lumber, logs and bolts, plywood and veneer, hardboard, insulation board, particleboard, and medium-density fiberboard--in all phases of manufacturing. Changing trends and patterns are examined. Included are the quantities of wood products used for materials handling (pallets and skids), packaging, shipping (dunnage, blocking, and bracing), and the making of jigs, models, patterns, and flasks used in the manufacturing process, as well as the actual quantities of wood in the final product itself.

42. Comparing In-Place Costs of Wood and Masonry Foundations

Spelter, Henry
Forest Prod. J. 33(9): 45-49; 1983.

This study analyzes the in-place costs of treated-wood foundations versus masonry foundations. The use of wood foundations in homes and low-rise structures is not high although the growth rate is strong. The potential for increasing lumber and plywood use in homes is significant if the wood-foundation system continues to perform well and the economics remain favorable.

43. Forest Service Research--New Views of an Old Mission

Youngs, Robert L.
Forest Prod. J. 33(11/12): 15-18; 1983.

The author describes the current situation relating to Forest Service research, and assesses the future of this research as one who is active in developing the answers to questions regarding this research.

mycology

44. On the Recent Proposal to Conserve *Hyphodontia* J. Erikss. against *Knieffiella* Karst.

Burdsall, H. H., Jr.; Larsen, M. J.
Mycotaxon 17: 513-516; 1983.

The authors furnish information for consideration which will promote conservation and preserve current usage of *Hyphodontia* over *Knieffiella*.

45. Notes on Tomentelloid Fungi V. Additional New Species of *Pseudotomentella*

Larsen, M. J.
Mycologia 75(3): 556-562; 1983.

Three species of *Pseudotomentella* are described as new from western North America: *P. molybdea* from Montana, *P. fumosa* from Oregon, and *P. kanikuensis* from Idaho. All are dimitic and associated with

brown-rotted wood of *Pseudotsuga menziesii* (Mirb.) Franco. A morphological basis for subgeneric grouping is discussed briefly.

46. *Fibroporia angulopora*, a New Species (Aphyllphorales, Polyporaceae) Associated with Brown-Rot of *Pseudotsuga menziesii* Residue in Western Oregon

Larsen, Michael J.; Lombard, Frances F.
Mycologia 75(4): 623-627; 1983.

A new wood-inhabiting basidiomycete, *Fibroporia angulopora*, from the Cascade Mountains in western Oregon is described. The fungus is associated with a brown-rot decay of Douglas-fir residue in old growth stands. Characteristics derived from studies of fruiting bodies and cultures are presented and incompatibility system (mating type) determined. The generic position of *F. angulopora* is discussed with reference to *Fibuloporia* and *Strangulidium*.

47. A Chemically Defined Medium for the Fruiting of *Lentinus edodes*

Leatham, Gary F.
Mycologia 75(5): 905-908; 1983.

The forest mushroom *Lentinus edodes* (Berk.) Sing. is the second most important cultivated mushroom worldwide. The annual production of this species is nearly 20 percent that of the commonly cultivated mushroom *Agaricus brunnescens* Pk. [= *A. bisporus* (Lange) Sing.]. The purpose of this study was to develop a chemically defined medium for the fruiting of *L. edodes*.

48. Cultural Study of *Piptoporus soloniensis* (Aphyllphorales, Polyporaceae)

Lombard, Frances F.
Mycologia 75(4): 723-727; 1983.

Piptoporus soloniensis causes a butt rot of oaks in the United States. The basidiocarps superficially resemble those of *Laetiporus sulphureus*, although cultures of the two species are readily distinguishable. Cultural characters of *P. soloniensis* are given and compared to those of *L. sulphureus*.

Isolation, Maintenance, and Pure Culture Manipulation of Ectomycorrhizal Fungi

Molina, Randy; Palmer, J. G.
In: Schenck, N. C., ed. Methods and principles of mycorrhizal research. St. Paul, MN: American Phytopathology Society; 1983; 115-119. (Available from libraries.)

packaging

49. Initial Use of Press-Dried Paperboard in Corrugated Fiberboard Containers

Bormett, David W.
Tappi J. 66(10): 92-95; 1983.

Press drying is a new technique developed for drying paper and paperboard webs with simultaneous heat and pressure. In this study the author combined the limited quantities of press-dried linerboards and corrugating mediums, from unrefined oak kraft pulp, remaining from a previous study and evaluated the corrugated fiberboard and boxes made with these components.

50. Edgewise Compression Creep of Fiberboard Components in a Cyclic-Relative-Humidity Environment

Byrd, Von L.
In: Proceedings, 1983 International Paper Physics Conference; 1983 September 18-22; Harwichport, MA; Atlanta, GA: TAPPI Press; 1983; 181-188.

This study measures creep response of individual linerboards and corrugating media used in previous study of corrugated fiberboards, and compares the components' creep responses to those of the fiberboards. Creep response of 100 percent oak linerboards made by press and conventional drying were also measured. Rates of moisture gain and loss during RH cycling were measured.

51. Package Performance Testing

Godshall, W. Duncan

ASTM Standardization News. Philadelphia, PA: American Society for Testing and Materials; 1982 October: 23-25. 1983 reprint.

The author reports on a new ASTM standard practice for performance testing of shipping containers and systems. The new practice is based upon the concept that each mode of transportation or portion of the distribution cycle has its own unique set of hazard elements that a shipping container must endure and survive, regardless of the nature of its contents. The practice provides a uniform basis for evaluating in a laboratory the ability of shipping containers or shipping units to withstand particular distribution environments.

52. Determining Paperboard Strength--Biaxial Tension, Compression, and Shear

Gunderson, D. E.; Rowlands, R. E.

In: Proceedings, 1983 International Paper Physics Conference; 1983 September 18-22; Harwichport, MA; Atlanta, GA: TAPPI Press; 1983: 253-263.

Paper used in corrugated containers and other structural applications is commonly subjected to biaxial loading, including shear stress. Strength data under these conditions are needed, but methods have not been available to test paperboard under controlled biaxial compressive stress or shear stress plus compression. This paper describes techniques for making these measurements and cites results.

processing

53. CROMAX: A Crosscut-First Computer Simulation Program to Determine Cutting Yield

Giese, Pamela J.; Danielson, Jeanne D.

USDA Forest Serv. Gen. Tech. Rep. FPL-38, 1983.

CROMAX simulates crosscut-first, then rip operations as commonly practiced in furniture manufacture. This program calculates cutting yields from individual boards based on board size and defect location. Such information can be useful in predicting yield from various grades and grade mixes thereby allowing for better management decisions in the rough mill.

54. Temperature and Restraint Variables in Continuous and Intermittent Press Drying

Gunderson, Dennis E.

In: Proceedings, 1983 International Paper Physics Conference; 1983 September 18-22; Harwichport, MA; Atlanta, GA: TAPPI Press; 1983: 145-154.

This study develops a means of controlling web temperature and pressing variables independently during the drying process, and assesses the effect of web temperature and continuous versus intermittent pressing force and x-y restraint on web densification and paper board properties.

55. Economics of Manufacturing Structural Lumber from Hardwoods Using the Saw-Dry-Rip (SDR) Concept

Harpole, George B.

Forest Prod. J. 33(6): 39-42; 1983.

Forest Service research has demonstrated that straight structural lumber can be manufactured from low- to medium-density hardwoods. The technique is referred to as the SDR system--saw to full width flitches, dry the flitches, and then rip to desired dimension lumber width. This paper presents an economic assessment of costs and possible revenues for a hypothetical 60-M-fbm (assuming logs 5- to 15-inch-diameter, 8-to 20-foot-long, and a two-shift, 250-day-per-year operation) SDR sawmill located in the hardwood regions of the United States. Based on comparisons of manufacturing costs to likely revenues, the SDR sawmill appears to be a viable investment opportunity.

56. DEP: A Computer Program for Evaluating Lumber Drying Costs and Investments

Holmes, Stewart; Harpole, George B.; Bilek, Edward

USDA Forest Serv. Gen. Tech. Rep. FPL-37, 1983.

The DEP computer program is a modified discounted cash flow program designed for analysis of problems involving economic analysis of wood drying processes. DEP's flexibility allows calculation of rate-of-return, break-even transfer prices, or break-even facilities costs. Data input requirements are simplified into basic analytical components that are explained and illustrated with example analyses.

57. Dielectric Properties of Lumber Loads in a Dry Kiln

James, William L.

USDA Forest Serv. Res. Pap. FPL 436, 1983.

The dielectric properties of wood were studied in a laboratory configuration that simulated typical lumber loads in a dry kiln. The specific objective was to establish a realistic equivalent circuit for a kiln and its load of lumber, and to determine how the elements of this equivalent circuit vary with kiln conditions. The transient effect of kiln conditions on the lumber stickers was found to influence dielectric properties more than had been recognized previously.

58. An Evaluation of Saw-Dry-Rip (SDR) for the Manufacture of Studs from Small Ponderosa Pine Logs

Maeglin, Robert R.; Boone, R. Sidney

USDA Forest Serv. Res. Pap. FPL 435, 1983.

Results from this study show that the saw-dry-rip (SDR) method produces higher yields of STUD grade material than is produced by conventional sawing and drying or than has been produced in other studies using young-growth ponderosa pine. The studs are also more stable.

59. Maximum Cutting Yields for 6/4 Ponderosa Pine Shop Lumber

McDonald, Kent A.; Giese, Pamela J.; Woodfin, Richard O.

USDA Forest Serv. Res. Pap. FPL 437, 1983.

This study was conducted to establish a foundation for automation in the moulding and millwork industry because of unnecessary harvest of thousands of trees to compensate for inefficient processing. This paper is part of a series on maximizing cutting yields of 5/4 and 6/4 Shop, and 6/4 Vertical Grain lumber.

60. Maximum Cutting Yields for 6/4 Ponderosa Pine Vertical Grain Lumber

McDonald, Kent A.; Giese, Pamela J.; Woodfin, Richard O.

USDA Forest Serv. Res. Pap. FPL 438, 1983.

The moulding and millwork industries consume about 1.3 billion board feet of Ponderosa Pine lumber annually. A sizable portion of the volume consumed is in 6/4 Vertical Grain lumber. Because of manual processing operations and high production speeds, many processing inefficiencies occur. The purpose of this research is to develop maximum cutting yield information for individual grades that can help improve the efficiency of such operations. This paper is part of a series on maximizing cutting yields of 5/4 and 6/4 Shop, and 6/4 Vertical Grain lumber.

61. Methods of Reducing Warp When Drying

Simpson, William T.

Asian Timber 2(5): 80-81; September/October 1983.

The author discusses and illustrates the common forms of warp and what can be done to minimize them in the lumber drying process.

62. Bacterial Oak: Drying Problems

Ward, James C.; Groom, David A.

Forest Prod. J. 33(10): 57-65; 1983.

Kiln-dried 4/4 northern red oak lumber was processed into millwork and yields were evaluated with respect to 1) normal and bacterially infected heartwood and 2) mild and accelerated kiln schedules. The presence of bacterially infected heartwood reduced yields from rough, dry lumber because of deep surface checks, honeycomb, and ring failure. Volume losses from bacterial oak lumber greatly increased with accelerated kiln-drying. An accurate system for commercial presorting of bacterial oak does not exist, and the possibilities for developing one are discussed.

pulp and paper

Evaluation of Blown Down Alaska Spruce and Hemlock Trees for Pulp

Fahey, Donald J.; Cahill, James M.
USDA Forest Serv. Res. Note PNW-407, 1983. (Available from Pacific Northwest Forest and Range Experiment Station, P.O. Box 3890, Portland, OR 97208. No charge.)

63. Improved Aspen Mechanical Pulp Through Coarse Grinding and Refining

Hedquist, Dale C.; Laundrie, James F.
USDA Forest Serv. Res. Pap. FPL 443, 1983.

The authors investigate the feasibility of refining coarse aspen groundwood (GW) pulp. At comparable freenesses, the quality of the unbleached, refined coarse GW pulp was equal to that of typical aspen GW pulp from the mill. Alkaline bleaching and post refining of the refined coarse aspen GW pulp increased its quality to equal that of bleached book grade GW pulp that contains about one part each of spruce, balsam fir, and aspen.

64. Economics of Increasing the Use of Recycled Corrugated Fiber in Linerboard

Ince, Peter J.; Klungness, John H.
In: 1983 Tappi Pulping Conference, Book 2; 1983 October 24-26; Houston, TX. Proc. Tech. Assn. Pulp Pap. Ind. Atlanta, GA: TAPPI Press; 1983: 719-725.

Production of kraft linerboard can be expanded technologically in two ways: using more recycled fiber or using more virgin kraft pulp. Conventionally, only 6 percent of the fiber used in kraft linerboard is recycled. This study analyzes the economics of increasing the use of recycled fiber to up to 50 percent of fiber furnish. On the bases of fiber raw material costs, various process costs, and capital costs, increasing the use of recycled fiber is economical compared to the alternative of expanding pulping capacity. The results of this study show that there are economic incentives for research and development of processes to increase the use of recycled fiber in linerboard, such as through upgrading size fractionation and removal of contaminants.

65. Biotechnology: Applications and Implications for the Pulp and Paper Industry

Kirk, T. K.; Jeffries, T. W.; Leatham, G. F.
Tappi J. 66(5) 45-51; 1983.

Biotechnology, which is simply the technological use of biological agents, encompasses much more than genetic engineering. In the pulp and paper industry, it includes many aspects of the growing of trees, facets of processing wood and pulp, the utilization of byproducts, and the management of wastes. Biotechnology research and development has the potential to alter many aspects of the industry. It is the authors' purpose to survey the implications that the newly recognized potentials of biotechnology have for the industry.

66. Fiber Separation with a Vaneless Spinning Disk: Application

Klungness, John H.; Oroskar, Anil R.; Crosby, E. Johansen
In: 1983 Tappi Pulping Conference, Book 2; 1983 October 24-26; Houston, TX. Proc. Tech. Assn. Pulp Pap. Ind. Atlanta, GA: TAPPI Press; 1983: 679-684.

Physical principles underlying present separation methods limit their effectiveness in upgrading certain papermaking furnishes. This study was undertaken to determine the feasibility of using wide-lip disks (WLDs) to upgrade wastepaper and high-density hardwood pulps. Exploratory experiments concerned with the separation of components of old corrugated containers (OCC), OCC contaminated with hot melt adhesive, high-yield unrefined oak kraft pulp, and a clay-containing pulp were conducted. Results showed WLDs to be most effective in single pass removal of hot melt from OCC, but not too effective for the removal at low solids of clay from pulp or of parenchyma fines from an oak kraft pulp. Wettability differences between the hot melt and woodpulp fibers determined the relatively good separation, and may have been the controlling factor in the other separations. This was shown to be theoretically possible. Data indicate this type of separation to be capable of dewatering pulp.

67. Fiber Separation with a Vaneless Spinning Disk: Determination of Mechanism

Oroskar, Anil R.; Crosby, E. Johansen; Klungness, John H.
In: 1983 Tappi Pulping Conference, Book 2; 1983 October 24-26; Houston, TX. Proc. Tech. Assn. Pulp Pap. Ind. Atlanta, GA: TAPPI Press; 1983: 673-678.

The mechanisms involved in spinning disk fractionation were investigated in order to determine disk designs which might be more appropriate for pulp separations. Disks designed to atomize liquids for spray drying were found to be inappropriate for efficient fiber fractionation. Specially designed wide-lip disks were used to examine separations of different rayon fiber slurries. The results indicated that fiber separation occurs primarily at the leading edge of the lip (disk shoulder) with the fibers detaching themselves from the liquid film. Detachment occurs when centrifugal and inertial forces, which tend to free the fibers from the film, overcome the surface force which tends to retain the fibers in the film.

68. Chapter 4: Observations on Load-Deformation Testing

Setterholm, Vance C.; Gunderson, Dennis E.
In: Mark, R. E., ed., Vol. I. Handbook of physical and mechanical testing of paper and paperboard. New York and Basel: Marcel Dekker, Inc.; 1983: 116-142.

This is an FPL overview of a wide spectrum of key considerations for measuring the basic strength and elastic properties of paper. It is included in Handbook of Physical and Mechanical Testing of Paper and Paperboard, and is written for technicians in pulp and paper industry.

residues and energy

69. COMPARE: A Method for Analyzing Investment Alternatives in Industrial Wood and Bark Energy Systems

Ince, Peter J.
USDA Forest Serv. Gen. Tech. Rep. FPL-36, 1983.

COMPARE is a FORTRAN computer program that provides complete guidelines for economic analysis of wood and bark energy systems. This report provides instructions on how to prepare data for COMPARE, information on how to use the program, sample data, sample output, and a listing of the program.

wood materials

70. Data for Prediction of Mechanical Properties of Aspen Flakeboards

Carll, Charles G.; Wang, Peiyuan
USDA Forest Serv. Res. Note FPL-0246, 1983.

The authors compared two methods of producing flakeboards with uniform density distribution (which could then be used to predict bending properties of flakeboards with density gradients). The relative strength and stiffness properties of uniform-density aspen flakeboards produced by the two pressing methods were compared.

71. Parallel-Laminated Veneer: Processing and Performance Research Review

Laufenberg, Theodore L.
Forest Prod. J. 33(9): 21-28; 1983.

This paper presents an overview of the parallel-laminated veneer (PLV) processing and performance technology developed and reported on in the last 15 years. In addition, this paper contains recommendations for further study.

72. Cost Comparison of Two Processes for Laminating Thick Veneer

Loehnertz, Stephen P.

Forest Prod. J. 33(11/12): 57-60; 1983.

This paper compares costs of two methods for laminating thick veneer.

In one method, a phenol-resorcinol adhesive is used, the press is unheated, and the adhesive is cured by the heat remaining in the veneer (residual heat) from drying. In the second method, a plywood phenolic adhesive is used, and the press is heated to supplement the residual heat of the veneer in order to cure adhesive. Drying times tend to be longer, but press times may be shorter, depending on veneer temperature. In some cases the production rate would increase.

73. Long-Term Load Performance of Hardboard I-Beams

McNatt, J. Dobbin; Superfesky, Michael J.

USDA Forest Serv. Res. Pap. FPL 441, 1983.

This paper reports the performances of eight 12-foot beams, each loaded for 5 years in interior or exterior exposure; eight 12-foot beams, each loaded for 2 years in a cyclic humidity environment; and eight 6-foot beams, each loaded for 4 years in exterior exposure. Some results are compared with results previously reported.

74. Relationship of Fiber Preparation and Characteristics to Performance of Medium-Density Hardboards

Myers, Gary C.

Forest Prod. J. 33(10): 43-51; 1983.

Techniques of characterizing and processing wood fibers were investigated as a means of evaluating the effects of raw material manipulation on strength properties, and dimensional movement of hardboard. Four species of wood, two hardwoods and two softwoods, were refined to four drainage rates. Relationships between wood species, fiber characteristics, and hardboard performance were examined. There was considerable variation in response of strength properties and dimension change to changes in fiber drainage rate.

75. Gluability of Platen-Dried Veneer of Douglas-Fir

Sandoe, M. D.; Wellons, J. D.; Parker, R. J.; Jokerst, R. W.

Forest Prod. J. 33(7/8): 57-62; 1983.

This study determined how platen drying at temperatures ranging from 325° F to 460° F affected strength and durability of adhesive bonds between veneers from second-growth Douglas-fir, because increased platen temperatures may be one way of offsetting low productivity with platen dryers. Bond quality decreased when 0.4-inch veneers were dried for long periods at the lowest temperature tested (325° F) and when 0.1-inch veneer was dried at high temperature.

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